

The Multiple Benefits of Reducing Greenhouse Gases

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- Co-Benefit Analysis
 - ◆ The Link Between GHG Emission Reductions, Conventional Air Pollution, and Avoidable Health Effects
- Preliminary (and On-going) US EPA Case Study of Wisconsin Climate Change Action Plan

Basics of Co-Benefit Analysis

- Several Terms Associated With “Co-Benefits” Concept
 - ◆ Ancillary Benefits (IPCC)
 - ◆ Harmonized Strategy Development
- Reducing GHG Emissions Will Generally Reduce Emissions of Conventional Air Pollutants
 - ◆ Key Emissions Also Reduced are NO_x, SO_x
 - ◆ Reverse is Sometimes True
- Conventional Air Pollutants of Concern are Fine Particulate Matter (PM 2.5) and Ozone
 - ◆ These are Secondarily Formed Pollutants, not Directly Emitted
- Reducing PM and Ozone Will Result in “Immediate” Reductions in Respiratory Diseases and Death
- Allows More Comprehensive Analysis of GHG Policies

Wisconsin Climate Change Action Plan

- Wisconsin DNR Released 4 Part Study in 1998
- First Phase: Voluntary State-Based Approach to Reducing Growth of GHG Emissions
 - ◆ Baseline Growth Predictions are 28% Growth from 1990 to 2010 (140 million tons to 180 million tons CO₂)
- Identified Set of “No-Regrets” Actions
 - ◆ Wisconsin State Government To Lead by Example
 - ◆ Voluntary Actions by Industry, Citizens
 - ◆ Energy Efficiency & Fuel Switching



Wisconsin GHG Emissions Reduction Cost Study Details

- Analyzed Policy Options up to \$30/Ton Carbon
 - ◆ Reduces carbon dioxide emissions by 21 Million Tons in 2010
- Emphasizes Energy Efficiency
- Cleaner Energy: Fuel Switching in Electricity Generation
 - ◆ Coal to Natural Gas (Cost: \$460 million)
- Significant Reductions in 2010 Conventional Emissions
 - ◆ Sulfur: 127,000 Ton Reduction in SO_x, or 87% of State Total
 - ◆ Nitrogen: 33,000 Ton Reduction in NO_x, or 16% of State Total



Steps in a Co-Benefit Analysis

- Emissions Inventory
 - ◆ SO_x and NO_x
 - ◆ Future Baseline and Control Levels of Complete Inventory
- Air Quality Modeling
 - ◆ PM 2.5 and Ozone are Secondary Formed Pollutants
 - ◆ Regional AQ Modeling Required
 - ◆ Estimate Future AQ Baseline and Control Levels
- Health Analysis
 - ◆ Health Effects Below the National Standards (NAAQS)
 - ◆ Acute Effects: Pollution Today
 - ◆ Chronic Effects: Lifetime Exposure

Health Effects Associated With Air Pollution

- Acute Effects from “Pollution Now”
 - ◆ Premature Mortality
 - ◆ Hospital Admissions
 - ◆ Acute Respiratory Diseases & Symptoms
 - ◆ Asthma Attacks
 - ◆ Work/School Absence
 - ◆ Minor Restricted Activity Days
- Chronic Effects from Lifetime Exposure
 - ◆ Developing Serious Respiratory Diseases



Design of Wisconsin Co-Benefit Study

- Low Cost Study
 - ◆ Use Existing Models, Methods
 - EPA PM Model (SR-Matrix)
 - EPA Health Model (CAPMS)
 - EPA Valuation and/or Cost of Illness Estimates
 - ◆ Use Pre-Existing Analytical Results
 - Emission Changes from Wisconsin Action Plan
 - Emissions Inventory from EPA Analysis of NOx SIP Call
- Concentrate on Wisconsin Impacts Only
 - ◆ Wisconsin-only Changes in Emissions
 - ◆ Only Air Quality Changes in Wisconsin



Preliminary Results

Health Effect		Avoided Incidence (cases/year)	Monetary Benefits (millions 1999\$)
Mortality	Ages 30+	230	\$1,300
Chronic Illness	Chronic Bronchitis	150	\$50
Hospitalizations	COPD-Related	27	\$0.3
	Pneumonia-Related	32	\$0.4
	Asthma-Related	24	\$0.1
	Cardiovascular-Related	80	\$1.5
	Asthma-Related ER	55	\$0.02
Minor Illness	Acute Bronchitis	525	\$0.03
	Upper Resp. Symptoms	5,800	\$0.2
	Lower Resp. Symptoms	5,800	\$0.1
	Asthma Attacks	4,800	\$0.2
	Work Loss Days	40,000	\$4

Summary

- Reducing GHG Emissions Will Generally Reduce Emissions of Conventional Air Pollutants
- Study Examined 11% Reduction in GHGs by 2010 (21 million tons)
 - ◆ Fuel Switching from Coal to Natural Gas
 - ◆ Lower PM Results in “Immediate” Reductions in Respiratory Diseases and Death; Lower Ozone Would Add More
 - ◆ Monetary Health Benefits: Approx. \$1.3 Billion per Year
- Use existing EPA Models, Valuation Methods
- Additional Health, Economic Benefits From Energy Efficiency Measures



Co-Benefit Analysis Tool Coming Soon

- COBRA Model now under Development
 - ◆ CO-Benefits Risk Assessment Model
 - ◆ Windows® model, designed to run fast
- New York State Model is prototype
 - ◆ Will have series of single state or region models
- Includes State/Region Emission Inventory
 - ◆ User can reduce a sector's annual NOx, SO2 or direct PM emissions by a % or by a # of tons
 - ◆ County, Metro Area or State-wide Reduction



COBRA Model

- PM Estimates
 - ◆ Estimated in all counties impacted
 - Not only in State/Region of Model
 - ◆ Estimates change in PM2.5, PM10 in affected counties
 - ◆ Most Impacts within a 500 km Range
- Health Estimates
 - ◆ Avoided Cases of Range of Health Effects in Each Impacted County

